

Application Serial No. 10/734,108
Amendment dated April 4, 2006
Reply to Office Action of October 4, 2005

Arguments

No claims have been amended or cancelled. As a result, claims 1-6 are pending in the Application. Reconsideration of all outstanding rejections is respectfully requested for the reasons that follow.

REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 1, 3, 5 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. in view of Brinegar et al. The Patent Office has repeatedly admitted that Shibata fails to teach applying an electromagnetic field to a vessel before the completion of loading the molten metal to the vessel, which holds and cools a molten metal for use in a rheocasting or thixoforming process (see Office Action mailed on April 18, 2005, page 3; Office Action mailed October 4, 2005, page 3).

However, the Patent Office contends that Brinegar cures Shibata's defect, alleging that Brinegar teaches applying an electromagnetic field before or during loading the molten metal to the crucible (vessel) for the purpose of controlling the fine-grained equiaxed slurry (non-dendritic casting), relying on column 3, lines 56+ (see Advisory Action, page 2).

Applicant disagrees. Brinegar at column 3, lines 56+ teaches that turbulence is induced in the molten metal prior to its introduction to the mold or while it is in the mold, by mechanically breaking the mixture into a plurality of streams or droplets at a location adjacent to the entrance of the mold or by electromagnetically stirring the molten metal

within the mold. See *a/so* column 8, lines 20-32.

Mechanically breaking, prior to the introduction of a molten metal to a mold, the molten metal being poured into the mold into a plurality of streams or droplets at a location adjacent to the entrance of the mold does not teach that "said sleeve is loaded with the molten metal in the state where said electromagnetic field is applied, and said electromagnetic field is applied to said sleeve before the completion of said loading of the molten metal." Mechanically breaking does not even teach or suggest applying an electromagnetic field.

Electromagnetically stirring a molten metal while the molten metal is within the mold only teaches that one applies an electromagnetic field to stir the molten metal within the mold. This does not teach or suggest when one should initiate applying the electromagnetic field. Conventional apparatuses apply an electromagnetic field after loading. In contrast, Applicant's claimed apparatuses apply an electromagnetic field before the completion of loading (i.e., before or during loading). Applicant submits that the Patent Office did not point out any suggestion or motivation for one to read "while the molten metal is within the mold" as teaching or suggesting before or during loading, as opposed to after loading.

Further, there is no basis for inferring that Brinegar teaches applying an electromagnetic field specifically before or during loading from the two distinct teachings of Brinegar (mechanically breaking prior to loading around the entrance of the mold and electromagnetically stirring the molten metal while the molten metal is within the mold).

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Applicant submits that only the present Application teaches applying an electromagnetic field before the completion of loading. Therefore, the Patent Office's inference is relying on the benefit of impermissible hindsight vision afforded by the claimed invention.

Thus, Applicant submits that Brinegar does not cure Shibata's defect, and the rejections over Shibata in combination with Brinegar are improper, and should be withdrawn.

Moreover, Brinegar's mold cannot be equated with Applicant's sleeve. Brinegar's mold is designed to produce a final product whereas Applicant's sleeve is designed to produce a semi-solid intermediate product for a secondary processing to manufacture a final product. Therefore, the walls of the Brinegar's mold is thicker than those of Applicant's sleeve (see figures 2-9 of Applicant's co-pending application 10/448,103). Such thick walls usually do not let an electromagnetic field penetrate to affect the molten metal in the mold. In fact, that is, Applicant believes, the reason why Brinegar reference does not give any examples using an electromagnetic field to stir the molten metal in the mold or any detailed descriptions of the working mechanism of the electrical stirring although Brinegar describes how the mechanical breaking works in detail. Therefore, one would not have equated Brinegar's mold with Applicant's sleeve.

Although the Patent Office argues that "the issue is not the container but the the[sic] control of the slurry by the EM field as taught by Brinegar et al.", the nature of a container is still important because thick-walled containers like Brinegar's do not let an electromagnetic field penetrate well, and that matters in determining whether or not

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Brinegar teaches or suggests using an electromagnetic field to control the slurry in the mold.

Furthermore, Brinegar's process is conventional die-casting, where a metal in a liquid state is poured into a mold, whereas Shibata's process is rheocasting or thixoforming, where a metal in a semi-solid state is injected into a mold. The Patent Office simply relies on the fact that Brinegar and Shibata both wish to control the fine-grained equiaxed slurry (non-dendritic casting), for motivation to combine the two references. However, controlling the fine-grained equiaxed slurry (non-dendritic casting) is such a general desirability that almost any process manufacturing metal products wish to achieve. This general desirability does not provide any suggestion or motivation to combine Brinegar with Shibata.

Further, as explained above, electromagnetically stirring a molten metal while the molten metal is within the mold only teaches that one applies an electromagnetic field to stir the molten metal within the mold. This does not teach or suggest when one should initiate applying the electromagnetic field. Further, this does not teach or suggest one can achieve a similar result by applying an electromagnetic field to a step other than mold-casting. "[V]arying all parameters or trying each of numerous possible choices until one possibly arrive at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful" is a typical example of the obvious-to-try rationale, which is explicitly taught as an incorrect obviousness standard. See MPEP 8th Ed. Rev.

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4, page 2100-168.

Further, assuming, *arguendo*, that Shibata and Brinegar could be combined to form a *prima facie* case of obviousness, it is rebutted by an unexpected result. The Application teaches that Applicant's claimed apparatuses result in unexpectedly improved microstructures and cooling time. The Patent Office's attention is respectfully directed to page 14, lines 10-21 of the Application, and the figures and the comparative examples 1 & 2 of co-pending application No. 10/419,929 for the proof of the unexpected results.

The co-pending application's figures 21A, 21B, 22A and 22B showing the microstructures of the metallic material produced by applying an electromagnetic field after the completion of loading according to conventional methods clearly show longitudinal dendritic structures. On the other hand, the co-pending application's figures 1B - 20B showing the microstructures of the metallic material produced by applying an electromagnetic field before the completion of loading as Applicant's claimed apparatuses show improved nondendritic structures.

Thus, for the reasons set forth above, Applicant submits that the rejection of claim 1 and the rejections of claims 3, 5 and 6, which depend from claim 1, are improper and should be withdrawn.

Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. in view of Brinegar et al and further in view of Doutre et al. Applicant respectfully traverses the rejection. As explained above, the combination of Shibata

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and Brinegar does not render claim 1 obvious, and therefore, claim 2, which depends from claim 1, cannot be rendered obvious over Shibata in view of Brinegar and further in view of Doutre unless Doutre cures the defect of the combination of Shibata and Brinegar.

Doutre is directed to selection of heating and cooling conditions of molten metallic slurry. Doutre, however, does not teach or suggest applying an electromagnetic field before or during loading the molten metal. Therefore, Doutre does not cure the defect of the combination of Shibata and Brinegar.

Thus, Applicant respectfully disagrees with the Patent Office's instant rejection of claim 2 since Doutre does not cure the defect of the combination of Shibata and Brinegar for the reasons explained above. As a result, Shibata, Brinegar and Doutre alone, in combination with one another or all together do not render claim 2 obvious as those references do not render claim 1 obvious. Thus, Applicant submits that the rejection of claim 2 is improper and should be withdrawn.

Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al in view of Brinegar et al and further in view of Nakao et al. Applicant respectfully traverses the rejection. As explained above, the combination of Shibata and Brinegar does not render claim 1 obvious, and therefore, claim 4, which depends from claim 1, cannot be rendered obvious over Shibata in view of Brinegar and further in view of Nakao unless Nakao cures the defect of the combination of Shibata and Brinegar.

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Nakao is directed to a method of injecting half-solidified metallic material into a mold. Nakao, however, does not teach or suggest applying an electromagnetic field before or during loading the molten metal. Therefore, Doutre does not cure the defect of the combination of Shibata and Brinegar.

Thus, Applicant respectfully disagrees with the Patent Office's instant rejection of claim 4 since Nakao does not cure the defect of the combination of Shibata and Brinegar for the reasons explained above. As a result, Shibata, Brinegar and Nakao alone, in combination with one another or all together do not render claim 4 obvious as those references do not render claim 1 obvious. Thus, Applicant submits that the rejection of claim 4 is improper and should be withdrawn.

In view of the foregoing, it is submitted that claims 1 through 6 are in condition for allowance. Allowance of claims 1 through 6 and of the Application is therefore respectfully requested. The Commissioner is hereby authorized to charge any fees or credit any overpayment to Deposit Account Number 02-2135.

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